REMARKS:

AMENDMENTS TO THE CLAIMS

Claims **12-17, 19-36,** and **38** were examined. Claims **12, 36,** and **37** are amended. Claim **27** is canceled. The Applicant submits that these amendments merely make explicit that which was implicit in the claims as originally filed. As such, no new matter has been entered with these amendments. Furthermore, the Applicant submits that these amendments do not narrow the scope of any claim limitation within the meaning of the decision in *Festo*. No new subject matter has been introduced.

INTERVIEW SUMMARY

Applicant thanks the Examiner for the courteous interview of July 25, 2008 with Inventor Brian M. Sager and Attorneys Joshua D. Isenberg and Hao Y. Tung. The cited references were discussed in light of the pending claims. Agreement with respect to the claims was not reached.

CLAIM REJECTIONS

35 USC 112

Claims **12, 16-17,** and **36** were rejected under 35 USC 112, first paragraph regarding enablement (repeated from previous office action). The Office contends that it is not clear what exact composition provides the claimed permeability to water vapor and oxygen, although Office agrees that page 4 lines 22-27 states that a number of permeabilities may be achieved by using suitable layers. The rejection is traversed in part and overcome in part.

With regards to permeability of claims **16** and **17**, the claimed permeability is entirely enabled because increasing the tortuous path by providing additional layers is sufficient to decrease permeability. As noted by the Office, page 4 lines 22-27 of the present application discusses that the more layers, the more tortuous the path for permeating molecules. Thus, the more layers, the less permeable the barrier film 100 is to water vapor and oxygen. Thus Applicant respectfully submits that these claims are within the grasp of one of skill in the art. Per MPEP 2164.01, an analysis of whether a particular claim is supported by the disclosure in an application requires a determination of whether that disclosure, when filed, contained sufficient information regarding the subject matter of the claims as to enable one skilled in the pertinent art to make and use the claimed invention. Applicant respectfully submits that one of skilled in the

art could arrive at the claimed permeability by increasing the number of layers to increase the tortuous path.

With regards to claims 12 and 36, the rejection is now moot as claims 12 and 36 are amended to remove such language and place the claims into better condition for allowance.

Claim **27** was rejected under 35 USC 112, first paragraph regarding written description (repeated from previous office action). This rejection is now moot as claim 27 is canceled.

Claims **12-17,** and **19-35** were rejected under 35 USC 112, first paragraph written description (repeated from previous office action). The phrase "a total number of layers of organic polymer and layers of organic material is at least 100 so that barrier film has a permeability to water vapor of less than about 0.01 g/m2/day" is disputed. This rejection is now moot as claims 12, 19, and 35 are amended to remove such language and place the claims into better condition for allowance.

Claims **12-17,** and **19-35** were rejected under 35 USC 112, first paragraph written description (repeated from previous office action). The phrase "in the one or more layers of organic polymer" is indefinite as it contradicts the phrase "more than one of the layers of organic polymer contain a superhydrophobic material." Claim 12 has been amended to correct for this informality.

CLAIM 12 IS ALLOWABLE OVER BRINKER AND DAM

Claims **12-21**, **23-25**, **27-30**, and **34-35** were rejected under 35 USC 103(A) as being anticipated by U.S. Patent 6,264,741 to Brinker et al. (hereinafter "Brinker") in view of European Patent No. 1225188 to Dams (hereinafter "Dams"). The Applicant respectfully traverses the rejection.

Claim **12** recites that the barrier film is a self-assembled structure wherein more layers of the organic polymer contain a superhydrophobic material, and that the covalent bond form in the self-assembled structure even in the presence of the superhydrophobic material in the one or more layers of the organic polymer. Support for self-assembled structure is found in [0029] of the published application, use of superhydrophobic material is discussed in paragraph [0012], and that support for covalent bonding is found in paragraph [0030] and that superhydrophobic material may be use din the organic layers as discussed in paragraph [0012].

Applicant has previously provided an affidavit under 37 CFR 1.132 by Stanford University Materials Science Professor Michael McGehee, submitted on February 22, 2008 ("McGehee Affidavit") regarding the nonobviousness of a self-assembled structure with superhydrophobic material as claimed. The affidavit notes that the self assembly process is based on a careful balance of hydrophilic and hydrophobic material, in order to cause the surfactant concentration to exceed the critical micelle concentration, resulting in micelle formation. The introduction of superhydrophobic material will disrupt the delicate balance of materials. The Applicants position is also that the McGehee Affidavit shows (1) that formation of the claimed nanolaminate barrier film by self assembly is a surprising result since it would not be expected to work with a superhydrophobic material; (2) that use of a superhydrophobic material in a self assembly process the is contrary to accepted wisdom in the art; and (3) there was no reasonable expectation of success in forming a nanolaminate barrier film by using a superhydrophobic material in a self assembly process. Thus, to have a self-assembled structure formed using a superhydrophobic material as presently claimed is non-obvious.

Per Examiner's request, Applicant further submit herewith a published technical paper setting forth the delicate balance associated with a micelle-based, self-assembly process. The paper entitled "Micelle Formation and Hydrophobic Effect" published in J. Phys. Chem. B 2004, 108, 6778-6781 succinctly describes the aforementioned balance in Equation 8 on page 6779 Col. 2. The ratio of hydrophobic to hydrophilic moities is relevant, as is the average length between them. As discussed in 6779 Col. 2. in the text leading up to equation 8, there is a **hydrophobic** driving force identified in the Lum-Chandler-Weeks theory. As noted in the paper, the strength of the driving force would grow without bound leading to macroscopic clusters unless such contributions are countered. As discussed, the hydrophobic driving force is countered by the third term discussed the paper regarding placing **hydrophilic** headgroups on the micelle surface.

As the Examiner can appreciate from the cited paper, there are a number of variables in play during such formation including but not limited to the balance of hydrophic and hydrophillc moieties. Thus, to have a self-assembled structure formed using a superhydrophobic material as presently claimed is non-obvious.

Furthermore, per the Examiner's request, experiments conducted as part of Applicant's investigation show that using the techniques set forth in the present application, a seven (7) fold

decrease in permeability relative to baseline perm abilities can be achieved. In such embodiments, the sol was made per the teachings of the present application by mixing silica precursor, ethanol, acid catalyst, and surfactant, then spin coating the sol at 1000 RPM onto the substrate, followed by either of two heating routes: (1) heat overnight at 100C under vacuum, or (2) condense silica under ammonia saturated atmosphere for 30 minutes, then heat two hours at 50C under vacuum. Both routes yielded substantially similar results. Structured or non-structured (negative control) films formed by the above process were double-coated onto commercially available membranes comprised of alumina (aluminum oxide) with 20 nm pores. Alumina is transparent in the visible spectrum, and easily spin coated. Templated films (using either cetyltrimethylammonium bromide (CTAB) (enabling 2nm pattern size) or and Pluronics 123 (P123) (enabling 8nm pattern size) as the surfactant resulted in nanolamellar films, and the permeation rate decreased a permeation decrease of about seven-fold for both cases.

As previously noted, there is no disclosure in Dams suggesting substituting the alternating layers to contain superhydrophobic material. Furthermore, in light of the supplied affidavit under under 37 CFR 1.132, altering the organic layer of the nanolaminate as claimed is non-obvious. As pointed out by the Office (Office Action of August 9, 2006 on page 5 lines 5-16), the traditional technique in the art as noted in the previously cited Singh reference is to change the inorganic layer by increasing the amount of silicate in the inorganic material to achieve good barrier properties (see Singh, page 64, lines 25-29). There is no teaching cited by the Office suggesting the modification of the organic layer to improve the moisture barrier qualities. Other than the teachings of the present application, Applicant fails to see where the Office has cited motivation to replace the multiple organic layers with that of Dams.

Furthermore per MPEP 2145(X)(D)(3), **proceeding contrary to accepted wisdom is evidence of nonobviousness**. Absent the teachings found in Applicant's patent application, the Office has failed to cite the motivation for one of skill in art to modify the nacre-like material of Brinker to be a moisture barrier with the permeability as presently claimed. Applicant has proceeded against accepted wisdom by incorporating water barrier qualities into the presently claimed laminate and by starting with a poor moisture barrier material. Since Brinker desires to mimic nacre (which is easily hydrated after only five hours of soaking in water per Barthelat, "Tensile Testing of Abalone Nacre Miniature Specimens Using Microscopy and Speckle Correlation", page 2, col. 4, paragraph 2) and the Office has not provided any basis showing that

Brinker layer is not somehow more of a moisture barrier than the material it seeks to copy, Applicant respectfully requests that the Office set forth the rationale for those of skill in the art to modify the nacre-like material of Brinker in view that doing so would be contrary to accepted wisdom by starting with water permeable material.

As the cited references fail to show or suggest the claimed invention, claim **12** and its dependent claims are now in condition for allowance. Claims **36** and **38** are believed to be allowable for substantially the same reasons set forth above. Additionally, claim **38** further recites that the film is at least 1000 nm thick comprised of individual layers, each roughly 1 nm thick (support found in paragraph [0030] of the published application) which is not shown or suggested by the cited art.

CONCLUSION

For the reasons set forth above, the Applicant submits that all claims are allowable over the cited art and define an invention suitable for patent protection. The Applicant therefore respectfully requests that the Examiner enter the amendment, reconsider the application, and issue a Notice of Allowance in the next Office Action.

Respectfully submitted,

/Hao Y. Tung/

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